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ABSTRACT

The design of an alternative administrative structure related to the cybernetic era and its organizational characteristics are discussed. In View of the role of electronic information systems today, it would be valuable to synthesize the six perspectives of administration--leader, manager, change agent, theorist, planner, and futurist--to provide a human organizational and administrative model appropriate to the age of information. A new form of administrative organization is also needed in large urban school systems. An image of incrementalism in history is presented; it remains to be seen whether the cybernetic era will prove to be something different from an increment. The crisis in educational administration is related to efforts by the administrative pyramid to maintain its form while attempting to adept to alternative components, but this cannot be done without dysfunction. The design proposed combines a form of the committee system with EDP. The complement abilities pattern (CAP) is one or more school administrator(s) designated by the computer information system as having those abilities, preferences, and characteristics required to solve a particular system problem. The CAP is formed on the basis of information provided concerning the characteristics of the problem in relation to its stored model of the school system and its stored information about each administrator. Parameters, descriptors, and certain information about the school system must be provided for CAP to design and analyze alternative solutions and programs. (KM)

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COMPUTER GENERATED ABILITY COMPLEMENTS AS AN ALTERNATIVE TO CONTINUOUS HIERARCHY POSITIONS: A CYBERNETIC MODEL OF SCHOOL ADMINISTRATION

A Paper Presented at the 1973
American Educational Research Association Convention

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The focus of this paper is the design of an alternative administrative structure related to the cybernetic era and its organizational characteristics. First, a chart (Figure 1) of developments in administration was developed to provide an overview of perspectives in this area. These perspectives could as well have been arranged in a circle since they are all extant and not necessarily developmental. The chart is adapted from Getzels (1968), McGrath (1972) and Hack (1971).

Administrator Defined	Administrative Science	Research Focus
1. Leader	An Art not Science	Abilities
2. Manager	Management Science	Techniques and Principles
3. Change Agent	Human Relations	The Group in the Organization
4. Theorist	Social Science	Roles and Organization
5. Planner	Systems	Organizational Processes
6. Futurist	Forecasting	Alternative Designs

Figure 1. Perspectives of administration.

A concept that will be examined later in this paper, incrementalism, seems to apply to these perspectives in the study and practice of administration; and the alternative model which is the focus of this paper may be viewed as incremental in relation to these perspectives. The cybernetic era asks humans one resounding question: What Can't Computers Do? (Dreyfus, 1972). With artificial intelligence or electronic information systems providing an increasing opportunity and requirement for a significantly new man - electronic symbiosis, there would appear to be value in synthesizing these six perspectives to provide a basis on which to design new organiza-

tional and administrative structures suitable to the age of cybernetics. In the model developed in this paper each perspective contributes to an alternative administrative design.

In addition to the apparent value of a synthesis of compatibly effective elements from each perspective, while discarding the ineffective or negative, to provide a human organizational and administrative model appropriate to the current age of information; there is obvious need for some new form of the organization of administration in large urban school systems. A condition of constant agitation and crisis indicates the incapacity of these systems to respond to client needs and aspirations effectively; systematic entropy dictates at least an examination of the design structure. The new design must enable administrators to behave in a radically new manner: instead of reacting to agitation in immediate, less than rational responses; school administrators require a design which provides systematic environmental assessment in terms of forecasting of probable events and discontinuities and leads to the rational planning of anticipated alternatives. Rather than temporarily diffusing crises, administrators could provide long range solutions which would necessarily include immediate and intermediate steps.

Pessimistic reactions to rational, long range planning and forecasting answer nothing; and there are now indications in the field of administration generally (Martino, 1972; Ewald, 1968; Ayres, 1969) and educational administration specifically (Green, 1971; Cockburn, 1970; Hack, 1971) that our society and its school systems are increasingly compelled to engage seriously in these new capabilities. Since education now faces the first major discontinuity in five centuries, the electronics revolution (Carnegie, 1972; Toffler, 1970; Drucker, 1969), it seems vital that alternative administrative designs be conceived and implemented. Presently, administration in education is not able to bring to a problem its own most critical capabilities; admin-

istrative structures relative to the cybernetic age must provide school systems with instantaneous problem-solution capacity. Some current and influential recommendations simply continue archaic structures into a new age (AASA, 1971). Adding to and improving the bureaucratic structure ignores the reality of the age of information by attempting to maintain and emphasize hierarchy, committees, and tradition.

Administration may now be equated with communications: the control is the message; the message is no longer the control. That is, "...ultimately administration will be improved less by empiricism than by conceptualization - less by collecting empirical solutions to operational problems than by understanding administrative and organizational processes in more fundamental and necessarily more abstract terms." (Getzels, 1968, p. 5).

Incrementalism

Marty (1969) points out that while people act according to their images of the future, they necessarily build these images from the past: memories. So the search for the future will be based on views already acquired. However, it could be reasonably claimed that revolutions are not made by such people; and all people are not so limited to the past and so closed to entirely new futures (Rokeach, 1960). If McLuhan (1965) and Toffler (1970) are correct, a generation much less limited by the past are coming of age and are producing to a large extent a new American Revolution (Revel, 1971). And neither they nor elder critics of the educational system (Goodman, 1970; Silberman, 1970) will settle for incrementalism. Whether the organization of education and educational administration will continue well into the cybernetic era or undergo radical change is yet to be seen of course. Following is a model which suggests a continuation of incrementalism; but it too is obviously based on images of the past. A process that seems to function in some manner with incrementalism can be termed figurism. The

latter concept may explain the few remaining kings, the apparent demise of bureaucracy (Toffler, 1970); and continued game-like interest in bows and arrows, hunting, and camping. Figure 2 provides an image of incrementalism in society, organization, and administration. Maclay (1972) clearly demonstrates the persistance of that social and organizational form called hierarchy. But living in a hierarchy is as appropriate for modern times as living in a cave (Pfeiffer, 1969).

In the model on incrementalism it may be noticed that bureaucracy was well developed in the agricultural era before Weber discovered it (Levy, 1966). Its roots, of course, are in hierarchy which has been with man longer than he was man (Maclay, 1972).

Note that in the development of the model from left to right one new construct is added at the top at each era, while constructs from previous eras are retained in the same or modified form and become the basis for the next construct on the list: so, hierarchy becomes hereditary hierarchy which becomes ambition hierarchy and finally temporary hierarchy.

The fourth major era, the cybernetic, has begun in our society (McLuhan, 1964) and may, indeed, prove to be something different from an increment. But the experience so far with modern electronics indicates an adding to rather than a replacing of older forms (Carnegie, 1972).

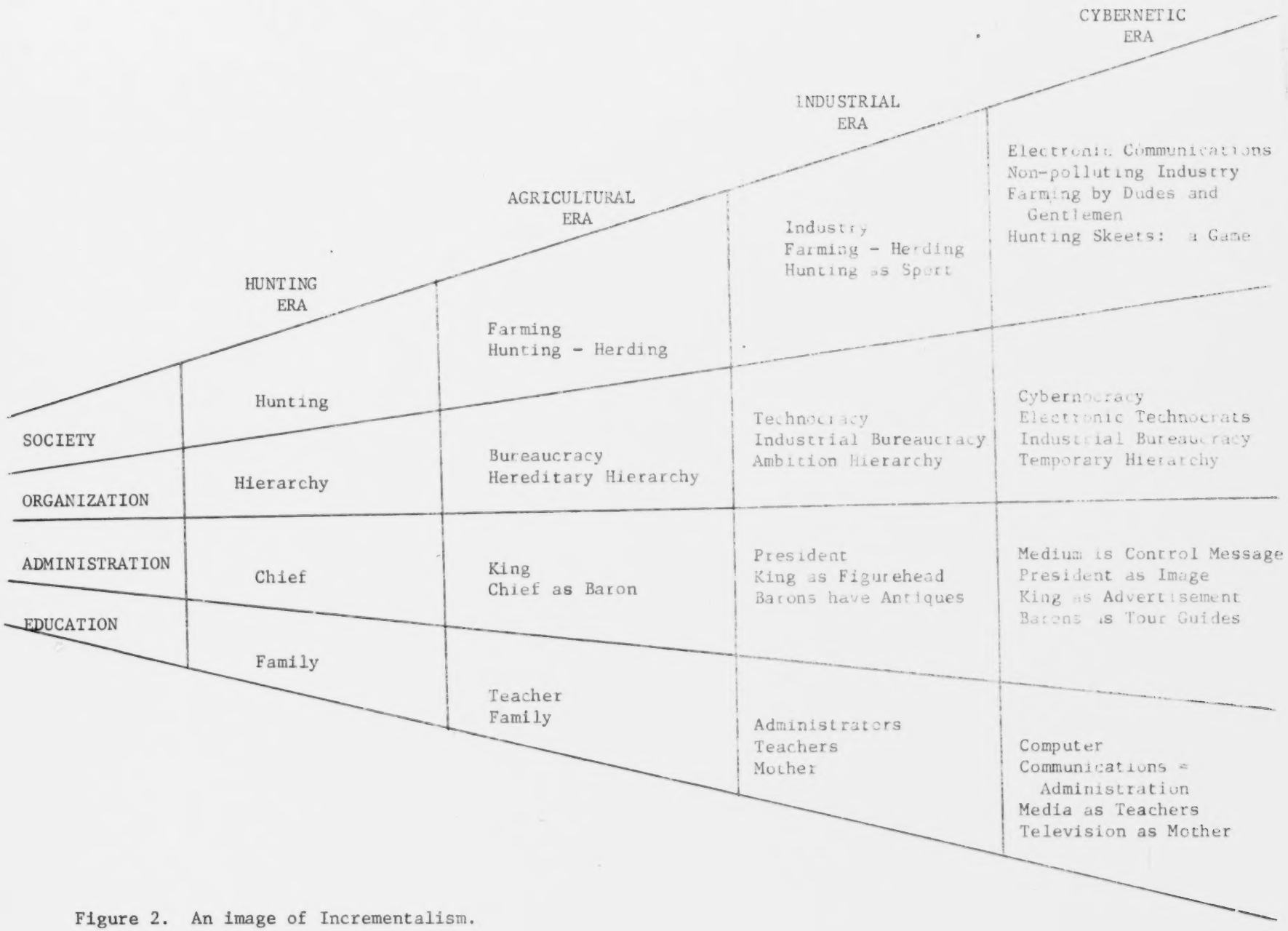

Figure 2. An image of Incrementalism.

Bureaucracy, Technocracy, and Cybernocracy

Presently, a combination of three major administrative components interact to provide an apparently powerful structure with at least minimum control and survival capabilities. Figure 3 illustrates the components in relation to other organizational constructs. The hierarchy, a dominant

Component	Information Flow	Functions
1. hierarchy	vertical	control and direction
2. committees	horizontal	equality and flexibility
3. electronic data processing	supportive	routines

Figure 3. Present administrative components.

characteristic of large, pyramid style school systems, seems to provide a capacity to withstand sudden change. In the committee there is a balance to hierarchy and a capacity to adapt to change by dispersing some control. Electronic data processing (EDP) serves the hierarchy primarily but in routine functions only.

But minimum survival is not enough: the continuing crisis in educational administration seems to demonstrate the following conditions: that the pyramid form of organization is very durable, that viable alternative forms are not available or are not acceptable, that the pyramid has been able to adopt and adapt at least some major components of alternative forms without essentially changing its structure, that the crisis is in part related to efforts by the pyramid to maintain its form while attempting to adapt to alternative components at an increasing rate, that the pyramid structure in the face of change and adaptation is unable to maintain its traditional or even a modified structure without dysfunction. The need for an alternative

to the pyramid becomes clear; a structure designed to change its structures rapidly and without dysfunction or crisis but with synergistic results is necessary.

Such a design emerged in the industrial era; it combined the characteristics of bureaucracy with the characteristics necessary to the industry and may be termed industrial bureaucracy or technocracy. To a great extent the educational bureaucracy was able to avoid this major change in design, while single-minded production-for-profit organizations were able to adopt elements such as automation, the production team, and the assembly line without losing much of what has been and still are considered bureaucratic components.

Technostructure, technocracy or ad hocracy (Galbraith, 1967; Toffler, 1970) seems to provide new components for an emerging design which the education system cannot reasonably be expected to avoid since the major characteristic of what may be termed cybernocracy is the dominance of information.

The characteristics of the cybernetic era and the components of cybernocracy are becoming clearer (McLuhan, 1964; Toffler, 1970; Hack, 1971). While hierarchy is still observable in the most cybernetic of organizations, it seems to be less important than the committee system and the requirements of EDP. The design proposed in this paper will combine a form of committee with EDP. One apparent cause of the primacy of committees is their ability to cross internal bureaucratic and hierarchical boundaries with the result of combining instantly and in sharp focus an administrative structure capable of performing where hierarchy alone lacks flexibility.

The changes occurring organizationally may be explained in this way: the pattern of organization has been shifting from dominant-submissive, hierarchical-pyrimidal, and conforming-regulating to functional-role-identity,

	Bureaucracy	Technocracy	Cybernocracy
Society	stability survival urbanization agriculture simple machines	change production industrial revolution technology complex machines	leisure media age of information cybernetics computer
Organization	crafts factory labor hierarchy mass man departments, divisions line and staff products	assembly line automation production teams mechanical extensions programs committees production and sales	information systems data analysis man-computer symbiosis electronic extensions systems temporary functions informational symbols
Administration	organizing, controlling vertical control vertical communication supervision rules and regulations authority figure	planning, problem solving horizontal control horizontal communication competition objectives and evaluation team management	forecasting, problem finding cybernetic control cybernetic communication complementarity role-identity functions ability complements

Figure 4. Characteristics of three organizational structures.

horizontal complementarity, and human-computer symbiosis.

Figure 4 presents a summary comparative analysis of the three major organizational systems and their administrative subsystems.

The Complement Abilities Pattern

Instead of "committee," "group," or "team" another concept was developed to avoid preconceptions or past images. The complement abilities pattern (CAP) is simply one or more school administrator(s) designated by the school system's computer information system as having those abilities, preferences, and characteristics required to solve a particular system problem. The CAP is formed on the basis of information provided concerning the characteristics of the problem in relation to its stored model of the school system and its stored information about each administrator. See Figure 5 which provides a general view of the interrelationships involved in the generation of a CAP. Once a CAP is formed the objective is to design a solution to the problem and to relate the solution to the existing school system. During the process of designing a solution CAP has available an information model of the school system as well as problem related information from a variety of sources stored in or retrievable by the computer system.

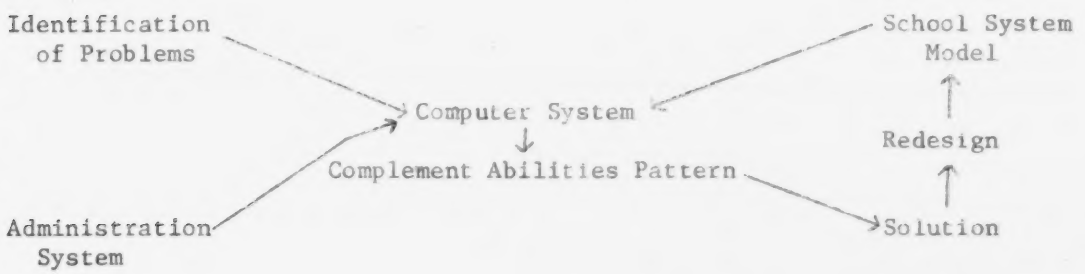

Figure 5. General model of CAP system.

Identification of problems. The system described in this paper begins with the identification of school system problems and ends with an addition to or a redesign of the school system. Identifying a problem in a school system is in itself an alternative to simple reaction. Even when agitation is involved, the reaction by the administration will be part of a process of solving the problem by changing the system in a planned sequence related to the needs of its clients. Three modes of identifying school system problems are:

1. agitation: students, and frequently enough parents, teachers and others not easily accounted for, very clearly present a clear and dramatic problem to the school system. Any treatment of the problem, a symptom, without information concerning causes is obviously dangerous.
2. forecasting: educational administrators have been engaged in a form of this for decades; but it has been narrowly confined to population trends and classroom requirements. Forecasting, including long range, may appear a luxury; however, as part of the information complex, school systems cannot be unaware of projected developments in information systems and their availability and implementation in the education system.
3. discontinuities (Drucker, 1969): unexpected and apparently insignificant developments break strong present trends. These are less obvious than trends and can be massively disruptive if not perceived early. A relevant ability is problem-finding (Foster, 1971).

A description of the problem is delivered to the computer system by using standardized descriptions on a computer terminal. See Figure 6.

Administration System. The use of descriptors allows the computer to

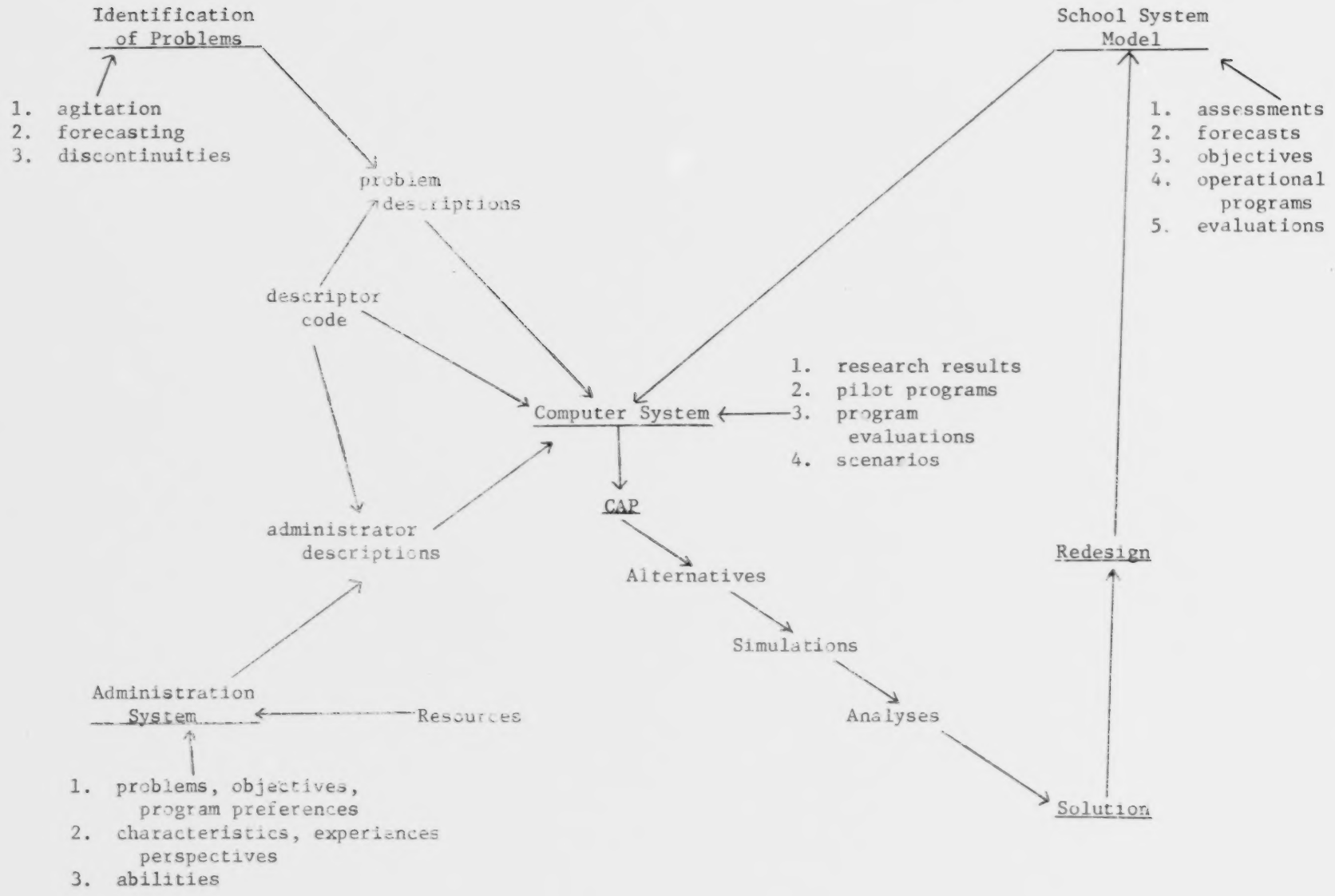

Figure 6. Model of CAP computer problem solution system.

relate new problem information with stored information on administrators and school system. The administrators provide information in three categories to maximize both their own individuality and their effectiveness in solving the problem:

1. preferences: ranking of school system problems, objectives, and programs according to the individual interest in them by the administrator.

2.1 characteristics: sex, height, weight, age, culture, work style, appearance, unusual

2.2 experiences: jobs, positions, courses, degrees, travel, recreation, unusual

2.3 perspectives: time frame, place frame, reading preferences, television preferences

3. abilities: systems, program design, simulation, planning, writing, directing, evaluation

Parameters. To guide the computer, certain limits are necessary for maximum number in one CAP, number of CAP's to which any one administrator may be designated, and priorities in establishing CAP's by ability, preference, characteristics, and availability should a conflict arise. In any case, complementarity requires the necessary mix of specializations to solve the problem.

Descriptors. It is clear that the CAP system depends on a descriptor code standardized to related problem data to administrator data and these to the school system model.

School System Model. Information on the following major components of the school system compose the computer-based model:

1. assessment results, analyses, conclusions, and implications

2. forecast results, analyses, conclusions, and implications
3. objectives (derived from assessment and forecast results)
4. operational programs (designed to attain objectives)
5. evaluations: results, analyses, conclusions, and implications

This model is used to analyze, evaluate, and redesign the school system by designing alternative objectives and programs, testing them as simulations, and analyzing, including cost-benefit, and evaluating the results. If this process produces a viable alternative a tentative solution is implemented. Available to the CAP in this process are stored data on the following:

1. research results, basic and applied, from prior experiments reported in the literature as well as those conducted in this system
2. results of pilot programs tested, evaluated, and reported
3. evaluation results of major program alternatives
4. scenarios designed and proposed in the literature

Solution. One or more pilot program alternatives may be operated simultaneously for any one identified problem. There may be a research design included in the pilot test. If research and evaluative results indicate a degree of success in terms of the problem related objectives, the model of the school system is redesigned.

Redesign. The extent of the redesign is the critical point. There appear to be no great obstacles in the way of adding new programs and adapting old programs. Elimination of a program seems to be much more difficult and radical change impossible. However, the pace of change in school systems has obviously increased in the decade since the first edition of Bennis, Benne, and Chin (1962), and the Elementary and Secondary Education Act of 1965.

In this proposed CAP system the new design is incorporated into the school

system model and the resulting new data provided to the computer system to complete the cycle.

An Emerging Organizational Design

Indeed, it seems reasonable to claim that the organizational pattern now emerging consists essentially of three components: the human information system, individually or collectively; the electronic information system, including television and other terminal connections; and what is just now taking some focus: a symbiotic human-electronic cybernetic system providing a new dimension of organizational direction and control.

With the hierarchical structure compromised by inter-level and inter-department complements, hierarchy may become no more than an organizational trace as the electronic information system becomes more developed and especially as administrators become more and more symbiotically related to it. This would create a cybernetic symbiosis where hierarchy and bureaucracy would not be necessary.

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